

Appln. No.: 10/524,253
Amendment Dated: May 7, 2007
Reply to Office Action of: March 5, 2007

MAT-8658US

Amendments to the Drawings:

The attached sheets of drawings include changes to FIGS. 1-7. These sheets replace the original sheets.

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Remarks/Arguments:

Claims 1, 7-11, 13, 16, 17, 20 and 21 are pending. Claims 1 and 21 were rejected. Claims 7-11, 13, 16, 17, 20 and 21 are objected to.

Drawings

The drawings were objected to for not being clear. The drawings have been amended to be more clear.

Rejection Under 35 U.S.C. §112, Second Paragraph

Claim 21 was rejected under 35 U.S.C. §112, second paragraph. Specifically, on page 2 of the Office Action, the Office Action asserts that the terms "unitary converting unit" and "unitary conversion processing" are not defined in the claims or specification. These terms are, however, defined in the specification at page 10, lines 3-12. As described in the specification, unitary conversion enables the arrival direction estimation processing in a beam space in which a directional vector is put into a real number. The specification recites, "...when an array antenna is a uniform linear array, a directional vector is put into a real number so that a throughput of operation can be reduced." (Page 10, lines 9-12).

Further, Unitary transformation itself is a method widely known to those skilled in the art. Unitary transformation is described in the document entitled "Adaptive Signal Processing in Array Antenna (Dr. N. Kikuma)," which was previously cited in an IDS filed on February 10, 2005, and is a method well known to those skilled in the art. It is described in the Kikuma document, "11.3.1 Unitary Conversion" (pp. 34-35) and "11.3.2. Estimation Algorithm" (pp. 36-41).

Accordingly, claim 21 is not subject to rejection under 35 U.S.C. § 112, second paragraph as being indefinite.

Rejection Under 35 U.S.C. §103(A)

Claim 1 was rejected under 35 U.S.C. §103(a) as being unpatentable over Matsuoka et al. This rejection is respectfully traversed. Matsuoka et al. does not disclose or suggest,

...Nd divided band direction estimating units for estimating the direction-of-arrival of a radio wave by **dividing the communication band** being said multi-carrier transmitted **into Nd bands and using ones of the plurality of sub-carrier signals belonging to the respective divided bands**, wherein Nd is at least 2 or a positive integer less than a number of sub-carriers used for multi-carrier transmission (Emphasis added).

Matsuoka et al. includes nine sub-carriers (S1, S2, . . . and S9) of which sub-carriers S2, S5 and S8 are pilot sub-carriers. (Para. [0040]). The antenna weights W1, W2 and W3 to be given respectively to these sub-carrier groups are calculated by means of the weight set calculation unit 112 with reference only to the pilot sub-carriers S2, S5 and S8. (Para. [0040] and Fig. 5).

In Matsuoka et al., each array receiving weight calculated by using a single pilot sub-carrier. The array receiving weight W1 is calculated by using a single pilot sub-carrier S2. The array receiving weight W2 is calculated by using a single pilot sub-carrier S5. The array receiving weight W3 is calculated by using a single pilot sub-carrier S8. Thus, if the receiving quality (SNR) of the pilot sub-carrier is low, the receiving weight (W1, W2, W3) is calculated by using the information of that low quality. This calculation presents the possibility of generating an improper receiving weight. Further, a reduction of qualities diffuses along with the near sub-carrier.

As recited in Applicants' claim 1, the communication band is divided into Nd (multiple) bands. The direction-of-arrival of a radio wave is estimated using **sub-carrier signals belonging to the respective divided bands**. Thus, sub-carriers contained in the divided bands are used.

Applicants' claimed features of using **sub-carrier signals belonging to the respective divided bands** is advantageous over the prior art because a more stable weight of the receive array may be created. For example, if a specific sub-carrier has a poor receiving quality, the comparatively good receiving quality of the nearby sub-carriers may be used to create a stable weight of the receive array. In this way, it becomes possible to obtain excellent characteristics by reconciling simplification of the circuit and a stable receiving quality.

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Because Matsuoka et al does not disclose or suggest the features of claim 1, claim 1 is not subject to rejection under 35 U.S.C. § 103(a).

In view of the foregoing amendments and remarks, this Application is in condition for allowance which action is respectfully requested.

Respectfully submitted,

Lawrence E. Ashery, Reg. No. 34,515
Attorney for Applicants

LEA/DFD/bj/fp

Attachments: Figures 1-7 (7 sheets)

Dated: May 7, 2007

P.O. Box 980
Valley Forge, PA 19482
(610) 407-0700

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